

Subminiature Transmissive Optical Sensor with Transistor Output



19601



21848

DESCRIPTION

The TCPT1300X01 is a compact transmissive sensor that includes an infrared emitter and a phototransistor detector, located face-to-face in a surface mount package.

FEATURES

- Package type: surface mount
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 5.5 x 4 x 4
- AEC-Q101 qualified
- Gap (in mm): 3
- Aperture (in mm): 0.3
- Typical output current under test: $I_C = 0.6 \text{ mA}$
- Emitter wavelength: 950 nm
- Moisture sensitivity level (MSL): 1
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Note

** Please see document "Vishay Material Category Policy":
www.vishay.com/doc?99902

APPLICATIONS

- Automotive optical sensors
- Accurate position sensor for encoder
- Detection of motion speed



PRODUCT SUMMARY

PART NUMBER	GAP WIDTH (mm)	APERTURE WIDTH (mm)	TYPICAL OUTPUT CURRENT UNDER TEST ⁽¹⁾ (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCPT1300X01	3	0.3	0.6	No

Note

- Conditions like in table basic characteristics/coupler

ORDERING INFORMATION

ORDERING CODE	PACKAGING	VOLUME ⁽¹⁾	REMARKS
TCPT1300X01	Tape and reel	MOQ: 2000 pcs, 2000 pcs/reel	Drypack, MSL 1

Note

- MOQ: minimum order quantity



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
COUPLER				
Total power dissipation	$T_{amb} \leq 95\text{ }^{\circ}\text{C}$	P_{tot}	37.5	mW
Junction temperature		T_j	110	$^{\circ}\text{C}$
Ambient temperature range		T_{amb}	- 40 to + 105	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	- 40 to + 125	$^{\circ}\text{C}$
Soldering temperature	In accordance with fig. 16	T_{sd}	260	$^{\circ}\text{C}$
INPUT (EMITTER)				
Reverse voltage		V_R	5	V
Forward current	$T_{amb} \leq 95\text{ }^{\circ}\text{C}$	I_F	25	mA
Forward surge current	$t_p \leq 10\text{ }\mu\text{s}$	I_{FSM}	200	mA
Power dissipation	$T_{amb} \leq 95\text{ }^{\circ}\text{C}$	P_V	37.5	mW
OUTPUT (DETECTOR)				
Collector emitter voltage		V_{CEO}	20	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	20	mA
Collector dark current	$T_{amb} = 85\text{ }^{\circ}\text{C}$, $V_{CE} = 5\text{ V}$	I_{CEO}	3.3	μA

ABSOLUTE MAXIMUM RATINGS

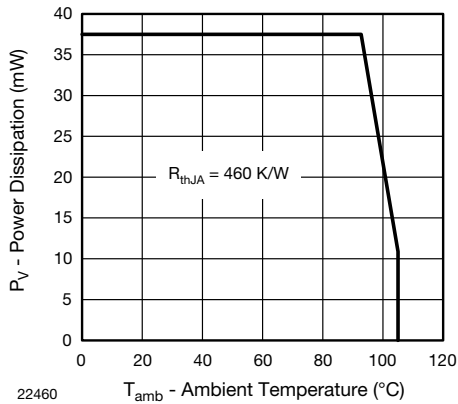


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature



Fig. 2 - Forward Current Limit vs. Ambient Temperature

BASIC CHARACTERISTICS (T _{amb} = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
COUPLER						
Collector current	V _{CE} = 5 V, I _F = 15 mA	I _C	300	600		μA
Collector emitter saturation voltage	I _F = 15 mA, I _C = 0.05 mA	V _{CEsat}			0.4	V
INPUT (EMITTER)						
Forward voltage	I _F = 15 mA	V _F	1	1.2	1.4	V
Reverse current	V _R = 5 V	I _R			10	μA
Junction capacitance	V _R = 0 V, f = 1 MHz	C _j		25		pF
OUTPUT (DETECTOR)						
Collector emitter voltage I _C	I _C = 1 mA	V _{CEO}	20			V
Emitter collector voltage	I _E = 100 μA	V _{ECO}	7			V
Collector dark current	V _{CE} = 25 V, I _F = 0 A, E = 0 lx	I _{CEO}		1	100	nA
SWITCHING CHARACTERISTICS						
Rise time	I _C = 0.3 mA, V _{CE} = 5 V, R _L = 100 Ω (see figure 3)	t _r		20	150	μs
Fall time	I _C = 0.3 mA, V _{CE} = 5 V, R _L = 100 Ω (see figure 3)	t _f		30	150	μs

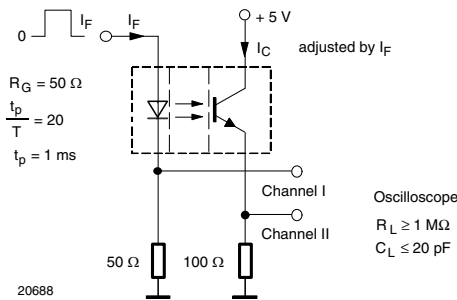


Fig. 3 - Test Circuit for t_r and t_f

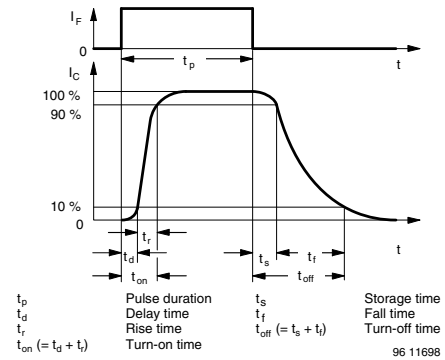


Fig. 4 - Switching Times

BASIC CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

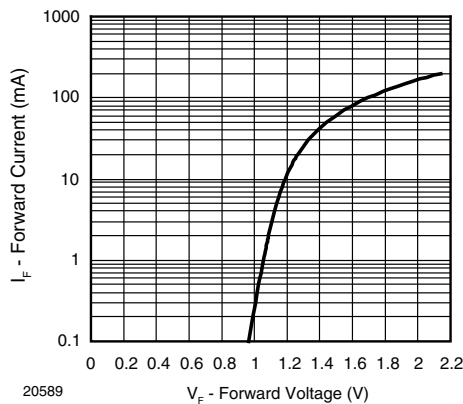


Fig. 5 - Forward Current vs. Forward Voltage

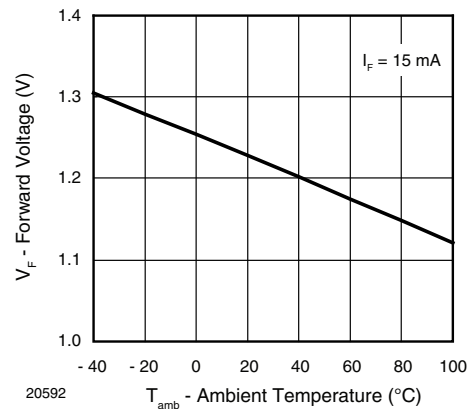


Fig. 6 - Forward Voltage vs. Ambient Temperature

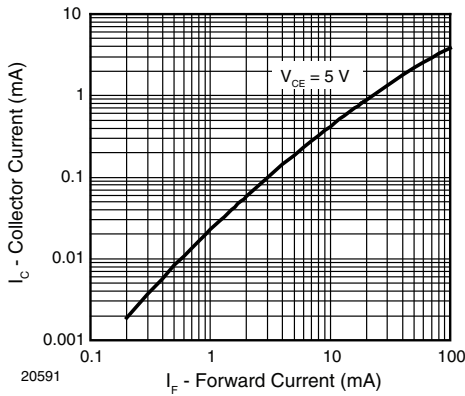


Fig. 7 - Collector Current vs. Forward Current

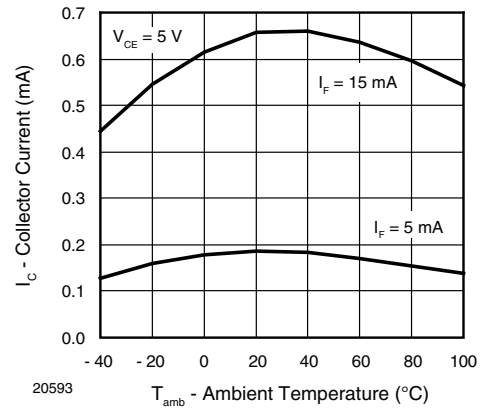


Fig. 10 - Collector Current vs. Ambient Temperature

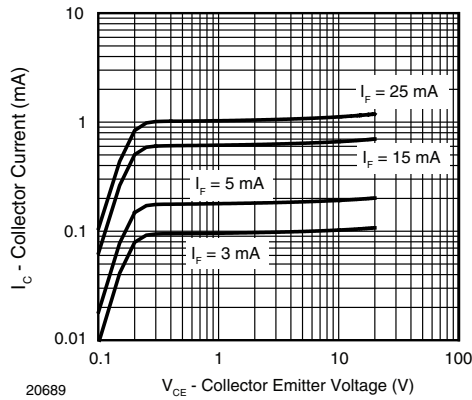


Fig. 8 - Collector Current vs. Collector Emitter Voltage

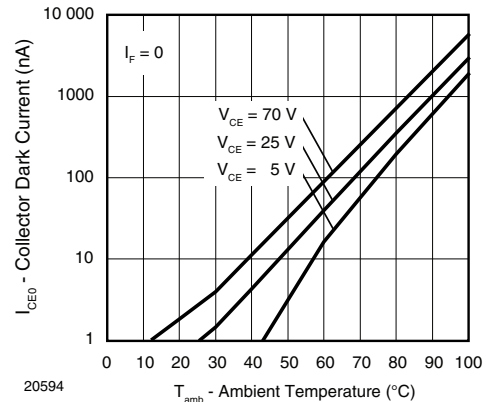


Fig. 11 - Collector Dark Current vs. Ambient Temperature

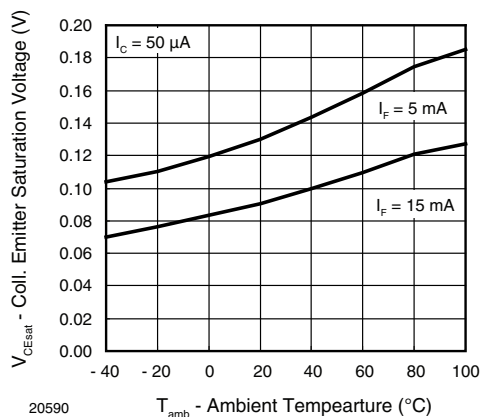


Fig. 9 - Collector Emitter Saturation Voltage vs. Ambient Temperature

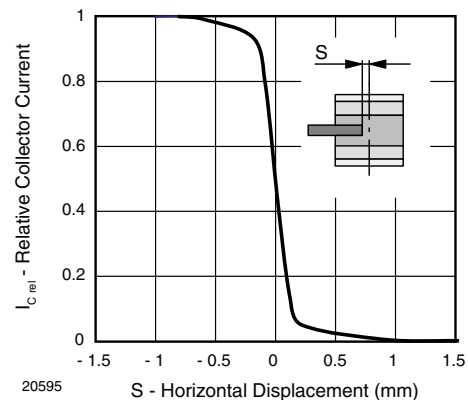


Fig. 12 - Relative Collector Current vs. Horizontal Displacement

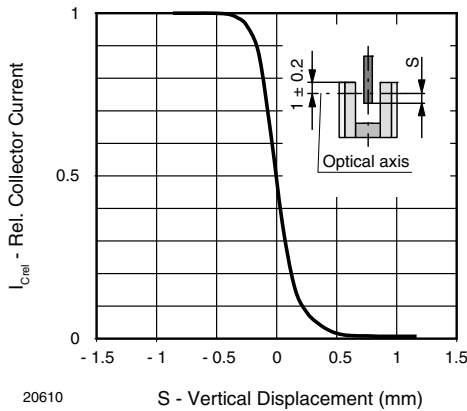


Fig. 13 - Relative Collector Current vs. Vertical Displacement

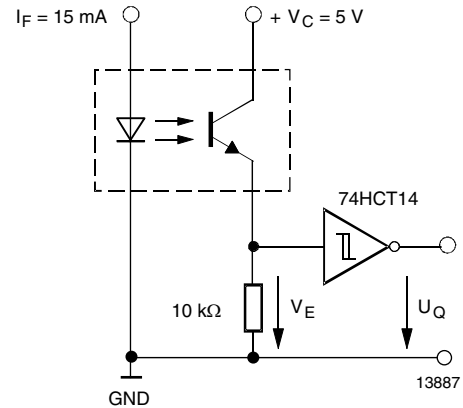


Fig. 15 - Application example



Fig. 14 - Rise/Fall Time vs. Collector Current

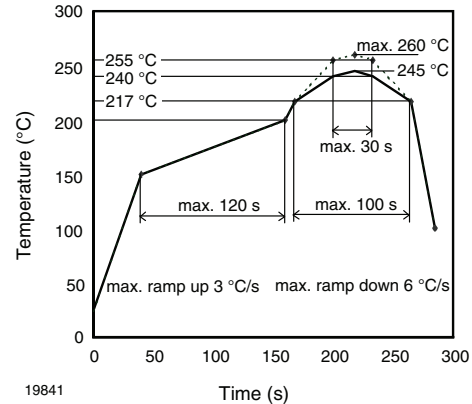


Fig. 16 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

FLOOR LIFE

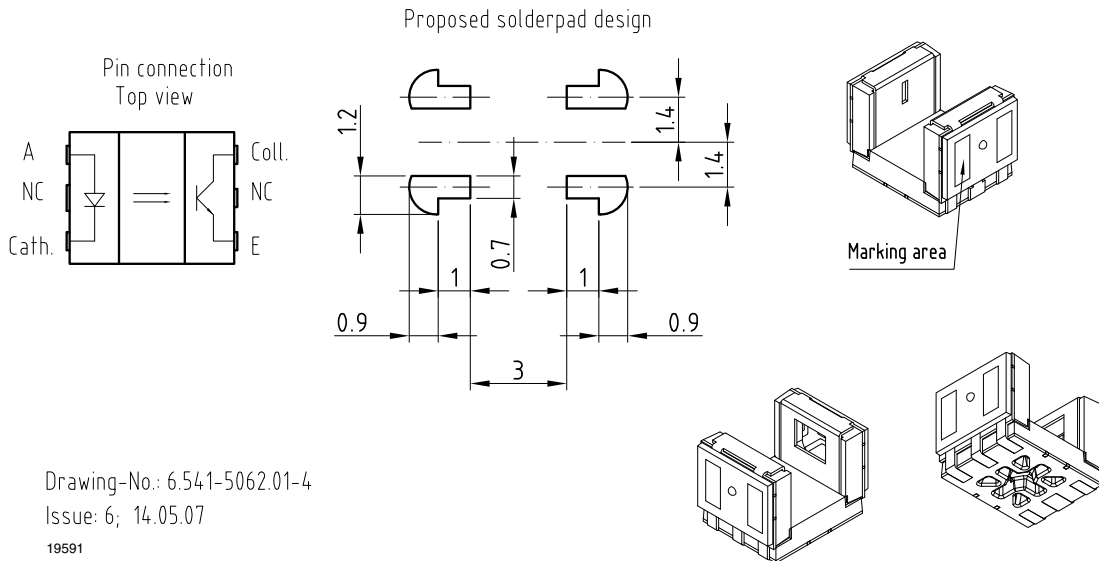
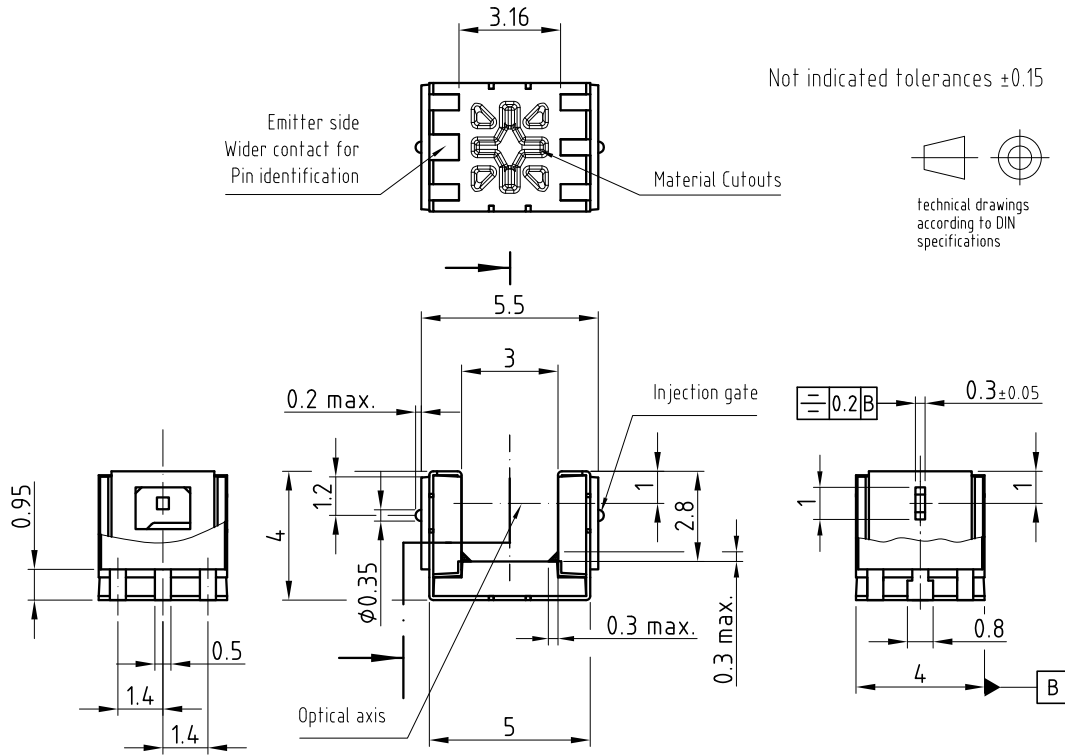
No time limit.
Moisture sensitivity level (MSL) 1, acc. JEDEC, J-STD-020.

RELIABILITY TESTS IN REFERENCE TO AEC-Q101 RELEASE			
TEST	CONDITION	DURATION	LOT SIZE - REJECTS
High temperature storage	$T_{stg (max.)} = 100\text{ }^{\circ}\text{C}$	1000 h	3 x 50 pcs - 0 pcs
Low temperature storage	$T_{stg (min.)} = -40\text{ }^{\circ}\text{C}$	1000 h	3 x 50 pcs - 0 pcs
Temperature cycling	$-40\text{ }^{\circ}\text{C}/+100\text{ }^{\circ}\text{C}$	1000 x	3 x 77 pcs - 0 pcs
H3TRB	85 °C/85 % RH, emitters: $V_R = 4\text{ V}$, detectors: $V_{CE0} = 5\text{ V}$	1000 h	3 x 77 pcs - 0 pcs
Intermittent operational life	Emitters: $I_F = 80\text{ mA DC}$, detectors: $V_{CE} = 16\text{ V}$, duty cycle: 2 min on, 2 min off, $T_{amb} = 25\text{ }^{\circ}\text{C}$	1000 h (15 000 cycles)	3 x 77 pcs - 0 pcs

RELIABILITY TESTS IN REFERENCE TO ENHANCED TEMPERATURE RELEASE ACC. AEC-Q101			
TEST	CONDITION	DURATION	LOT SIZE - REJECTS
High temperature storage	$T_{stg (max.)} = 125\text{ }^{\circ}\text{C}$	1000 h	1 x 50 pcs - 0 pcs
Temperature cycling	$-40\text{ }^{\circ}\text{C}/+150\text{ }^{\circ}\text{C}$	1000 x	1 x 77 pcs - 0 pcs
Power temperature cycle	$-25\text{ }^{\circ}\text{C}/+85\text{ }^{\circ}\text{C}$, $I_F = 50\text{ mA}$, $V_{CE} = 16\text{ V}$, 2 min. on, 2 min. off	1000 h (15 000 cycles)	1 x 77 pcs - 0 pcs



PACKAGE DIMENSIONS in millimeters



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